LOWER HOUSATONIC RIVER BASIN
SHELTON, CONNECTICUT

TRAP FALLS RESERVOIR DAM
CT 00091

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

AUGUST 1978

UNCLASSIFIED

ECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

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DAMS, INSPECTION, DAM SAFETY,

Lower Housatonic River Basin
Shelton, Conn.
Trap Falls Reservoir Dam

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The dam is a concrete gravity structure with concrete buttresses adjacent to the downstream face of the dam spaced at approx. 18 ft. on center. An earthen embankment slopes down from the exposed concrete section at a maximum inclination of 2 horizontal to 1 vertical on the downstream side of the dam. The structure is approximately 1080 ft. long and has a maximum height of approximatley 48 ft. above the old streambed. Outlets consist of a 30 inch cast iron low level line at elevation 172, a 30 inch cast iron transmission main and an 8 inch cast iron service main. The spillway is a 137 ft. wide anppe-shaped concrete weir with concrete sidewalls

407-440

TRAP FALLS RESERVOIR DAM

CT 00091

LOWER HOUSATONIC RIVER BASIN
SHELTON, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT

PHASE I INSPECTION REPORT

NATIONAL PROGRAM OF INSPECTION OF DAMS

Name of Dam:	TRAP FALLS RESERVOIR
Inventory Number:	CT 00091
State Located:	CONNECTICUT
County Located:	FAIRFIELD
Town Located:	SHELTON
Stream:	PUMPKIN GROUND BROOK
Owner:	BRIDGEPORT HYDRAULIC CO.
Date of Inspection:	JUNE 8, 1978
Inspection Team:	PETER HEYNEN
	MICHAEL HORTON
	GONZALO CASTRO
	HECTOR MORENO

The dam is a concrete gravity structure with concrete buttresses adjacent to the downstream face of the dam spaced at approximately 18 feet on center. An earthen embankment slopes down from the exposed concrete section at a maximum inclination of 2 horizontal to 1 vertical on the downstream side of the dam. The structure is approximately 1080 feet long and has a maximum height of approximately 48 feet above the old streambed. Outlets consist of a 30 inch cast iron low level line at elevation 172, a 30 inch cast iron transmission main and an 8 inch cast iron service main. The spillway is a 137 foot wide nappe-shaped concrete weir with concrete sidewalls. The area downstream of the dam consists of residential and industrial developments, Connecticut Route 8, and further downstream, urban areas of Stratford.

Based upon visual inspections at the site and past performance history, the dam appears to be in good condition. No evidence of structural instability was observed in the concrete section, buttresses or the earthen embankment. However, there are some areas which require attention.

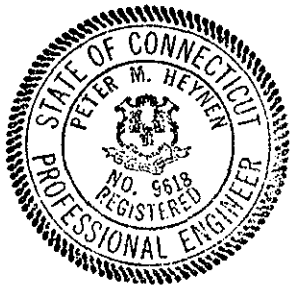
Based upon the size (Intermediate) and hazard classification (High) in accordance with Corps guidelines, the test flood will be equal to the Probable Maximum Flood (PMF).

Based upon our hydraulic computations, the spillway capacity is 4300 cubic feet per second, which is in excess of 100 percent of the Test Flood. Peak inflow to the reservoir is 2600 cubic feet per second; peak outflow (Test Flood) is 1400 cubic feet per second with the dam maintaining a minimum freeboard of 1.8 feet. The peak failure outflow from the dam breaching would be 128,000 cubic feet per second. A breach of the dam would develop a 24 foot wave downstream of the dam causing flooding and severe loss of life and damage to property.

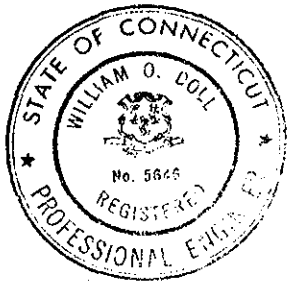
It is recommended that the left wingwall adjacent to the spillway be monitored to ascertain whether movement which has occurred to date is continuing. Should the wall movement continue, it may be necessary to take remedial action, such as installation of weep holes or placement of freely draining material behind the wall and possible repair of the wall itself.

An operation and maintenance plan should be instituted as described in Section 7.

The above recommendations and remedial measures should be instituted within one year of the owner's receipt of this Phase I Inspection Report.



Peter M. Heynen, P. E.
Project Manager
Cahn Engineers, Inc.



William O. Doll, P. E.
Chief Engineer
Cahn Engineers, Inc.

This Phase I Inspection Report on Trap Falls Reservoir Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspection. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionarly in nature. It would be incorrect to assume that the present condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions there of. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as neccessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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APPENDIX

*Note: See special Note Appendix Section B - Availability of Data

OVERVIEW PHOTO

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS. CAHN ENGINEERS. INC. WALLINGFORD, CONN. ARCHITECT —— ENGINEER	NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS	TRAP FALLS RESERVOIR DAM PUMPKIN GROUND BROOK	SHELTON CONNECTICUT	DATE 6/8/78 CE # 27 531 GI PAGE x

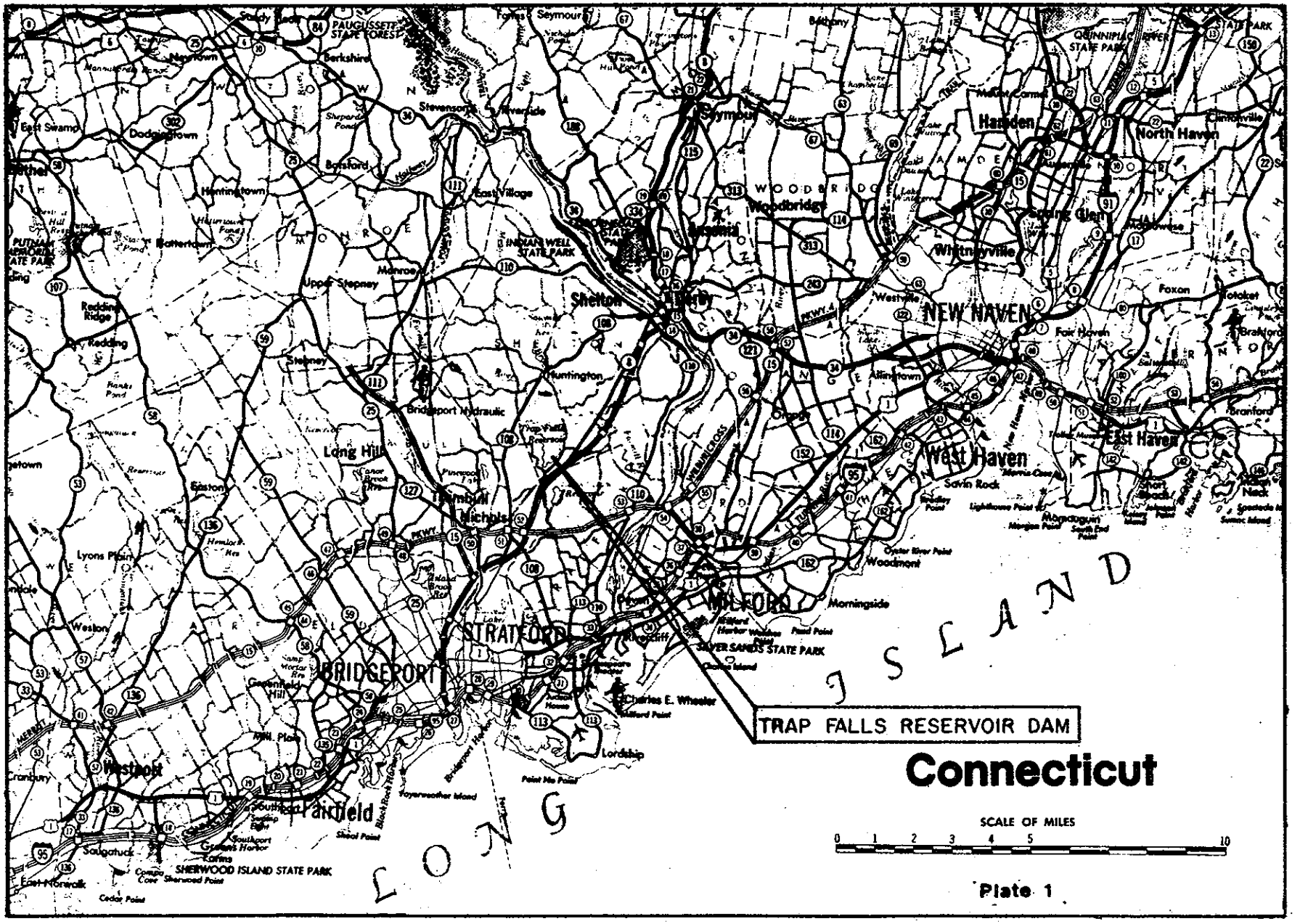

TRAP FALLS RESERVOIR DAM
Connecticut
SCALE OF MILES
0 1 2 3 4 5 10
LONG ISLAND
NEW HAVEN
BRIDGEPORT
STRATFORD
MILFORD
Shelton
Derby
Ansonia
Woodbridge
Hamden
North Haven
West Haven
East Haven
Fairfield
Westport
Norwalk
Wilton
Redding
Ridgefield
Danbury
Newtown
Monroe
Trumbull
Stratford
SHERWOOD ISLAND STATE PARK
INDIAN WELL STATE PARK
SILVER SANDS STATE PARK
QUINNIPIAC RIVER STATE PARK
PAUGUSSETT STATE FOREST
PUTNAM MEMORIAL STATE PARK

Plate 1

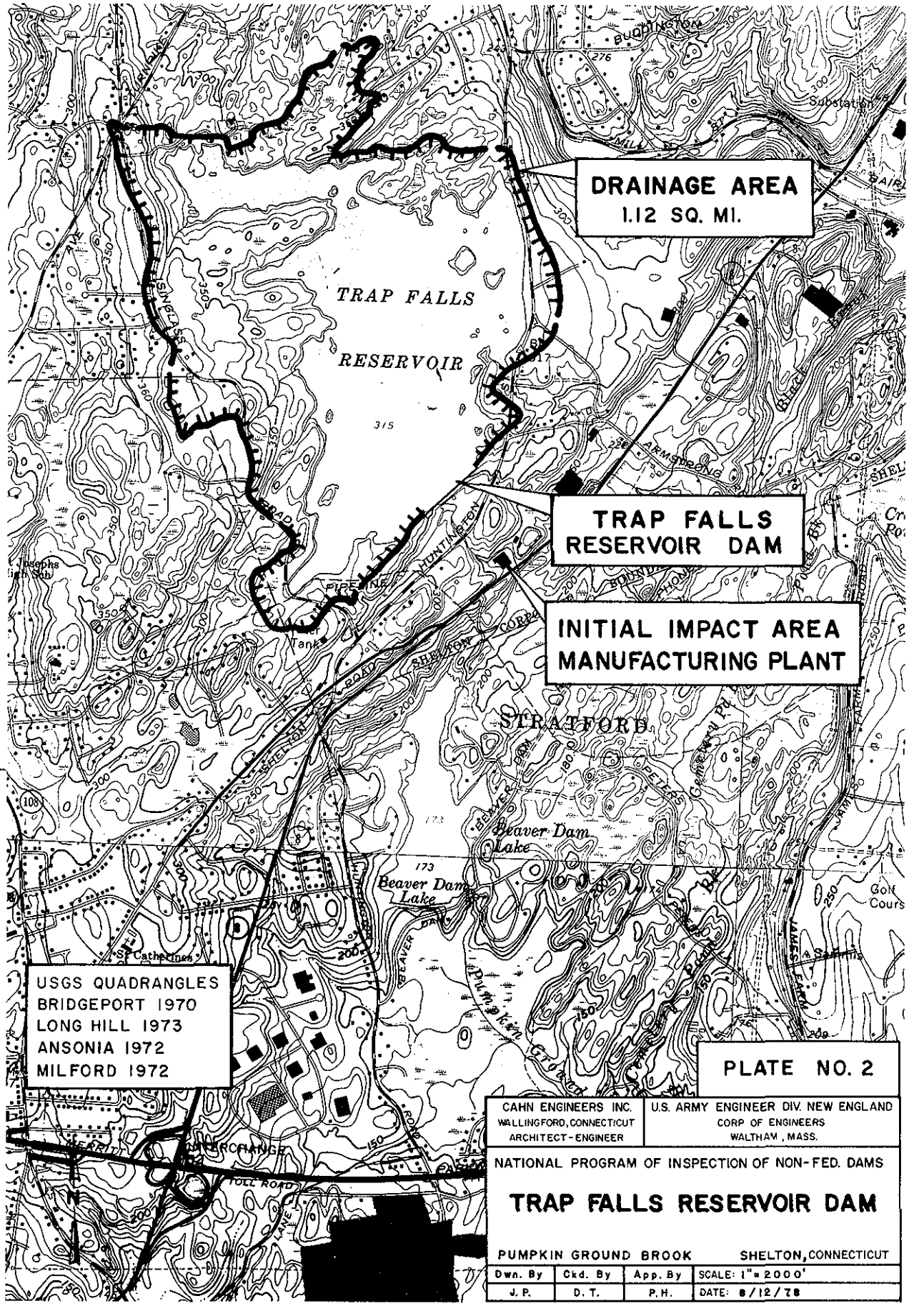


PLATE NO. 2

CAHN ENGINEERS INC. WALLINGFORD, CONNECTICUT ARCHITECT-ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORP OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

TRAP FALLS RESERVOIR DAM

PUMPKIN GROUND BROOK SHELTON, CONNECTICUT

Dwn. By	Ckd. By	App. By	SCALE: 1"= 2000'
J. P.	D. T.	P. H.	DATE: 8/12/78

PHASE I INSPECTION REPORT

TRAP FALLS RESERVOIR DAM

SECTION I

PROJECT INFORMATION

1.1 General

a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Cahn Engineers has been retained by the New England Division to inspect and report on selected dams in the southwestern state of Connecticut. Authorization and notice to proceed were issued to Cahn Engineers, Inc. under a letter of April 26, 1978 from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0310 has been assigned by the Corps of Engineers for this work

b. Purpose of Inspection Program - The purposes of the program are to:

(1) Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interest.

(2) Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.

(3) To update, verify and complete the National Inventory of Dams.

c. Scope of Inspection Program - The scope of this Phase I inspection report includes:

(1) Gathering, reviewing and presenting all available data as can be obtained from the owners, previous owners, the state and other associated parties.

(2) A field inspection of the facility detailing the visual condition of the dam, embankments and appurtenant structures.

(3) Computation concerning the hydraulic and hydrology of the facility and its relationship to the calculated flood through the existing spillway.

(4) An assessment of the condition of the facility and corrective measures required.

It should be noted that this report does not pass judgement on the safety or stability of the dam other than on a visual basis. The inspection is to identify those features on the dam which need corrective action and/or further study.

1.2 Description of Project

a. Description of Dam and Appurtenances - The dam is a concrete gravity structure with concrete buttresses adjacent to the downstream face of the dam spaced at approximately 18 feet on center. An earthen embankment slopes down from the bottom of the exposed concrete section at a maximum inclination of 2 horizontal to 1 vertical on the downstream side of the dam. The structure is approximately 1080 feet long and has a maximum height of approximately 48 feet above the old streambed. The upper gatehouse and screen house are located on and adjacent to the exposed concrete section near the center of the dam, while the control room including the treatment plant and the booster pumping station are located below at the toe of the downstream earthen embankment. Outlets consist of a 30 inch cast iron low level line at elevation 272, a 30 inch cast iron transmission main, and an 8 inch cast iron service main. The spillway is a 137 foot wide nappe-shaped concrete weir with concrete sidewalls. The bottom of the spillway channel is lined with hand placed stone, while the sidewalls are of concrete. The area downstream of the dam consists of residential and industrial development, Connecticut Route 8, and further downstream, urban areas of Stratford.

b. Location - The dam is located on Pumpkin Ground Brook in a rural residential area of the town of Shelton, County of Fairfield, State of Connecticut. The dam is shown on the Long Hill U.S.G.S. Quadrangle as having coordinates of longitude W73° 8' 26" and latitude N41° 15' 55".

c. Size Classification - INTERMEDIATE - The storage is 8500 acre feet at the top of the dam, elevation 319.8, which is approximately 48 feet above the elevation of the old streambed. According to the Recommended Guidelines, a dam with from 1000 to 50,000 acre feet of storage is classified as being Intermediate.

d. Hazard Classification - HIGH (Category I) -The area downstream of the dam includes residential and industrial developments, Connecticut Route 8 and urban developments in the town of Stratford. A breach of the dam has potential for severe loss of life and property damage.

e. Ownership - The Bridgeport Hydraulic Company
835 Main Street
Bridgeport, Connecticut
Mr. Edward Stangl
Phone (203) 372-1766

f. Purpose of Dam - Public Water Supply

g. Design and Construction History - The following information is believed to be accurate based upon the plans and correspondence available and included in the Appendix. The dam was originally constructed in 1905 and raised approximately 11 feet in 1916 to its present elevation. The 1905 construction and the 1916 modifications were engineered by Albert B. Hill. In 1963, the outlet works were improved to provide increased service capacity. This construction was performed by E & F Construction Company as engineered by Hazen and Sawyer, Engineers. A large pump station and control room addition to the treatment plant were constructed in 1967.

h. Normal Operational Procedures - The reservoir is maintained as high as possible without overflowing the spillway, in order to provide adequate water supply. Diversions from Mean Brook, Farm Mill River, and the Housatonic River feed into the reservoir. As of 1963, approximately 30 percent of the water distributed by the Bridgeport Hydraulic Company passed through Trap Falls Reservoir.

1.3 Pertinent Data

a. Drainage Areas - 1.1 square miles (704 acres). Rolling, wooded terrain.

b. Discharge at Dam Site - Maximum Known Flood -8 3/4" over the spillway on October 16, 1955. Total spillway capacity at elevation 319.8 (top of dam) 4300 cfs.

c. Elevation - (Ft above MSL, USGS Datum)

Top of dam:	319.8
Spillway Crest:	315.8
Streambed:	271.8
High Level Intake: (downstream face of dam)	278±
Low Level Intake: (downstream face of dam)	272±

d. Reservoir - Length of Normal Pool: 6000 ft.

Length of Maximum Pool: 6000+ ft.

e. Storage - At Elevation 315.8 7100 acre ft.

At Elevation 319.8 (top of dam) 8500 acre ft.

f. Reservoir Surface -

At Elevation 315.8	344 acres
At Elevation 319.8	344+ acres

g. Dam -

Type:	Concrete gravity section with downstream concrete buttresses and earthen embankment.
Length:	1080± feet
Height:	48± ft. above original streambed
Top Width:	11 feet
Side Slope:	Downstream 2H to 1V
Impervious Core:	Concrete structure.
Cutoff:	Available data indicates founded on rock.

h. Diversion and Regulatory Tunnel - Not Applicable.

i. Spillway

Type:	Concrete weir.
Length of Weir:	138 feet
Crest Elevation:	315.8
Upstream Channel:	None
Downstream Channel:	Hand-placed stone.

j. Regulatory Outlets

High Level Intake:	Size 30 inch dia. cast iron transmission line mechanically operated and located in downstream face at approximate elevation 278.
Low Level Intake:	Size 30" dia. cast iron, mechanically operated, and located in downstream face at approximate elevation 272.

SECTION 2: ENGINEERING DATA

2.1 Design

a. Available Data - The available data consists of drawings, correspondence, calculations, and reports by the Bridgeport Hydraulic Company, Roald Haestad, Inc., Dames and Moore, Albert B. Hill, Hazen and Sawyer, and others. The majority of correspondence pertains to yearly inspection reports of Bridgeport Hydraulic Company Dams, including Trap Falls Reservoir Dam.

b. Design Features - The maps and drawings included in the Appendix show the design features of the dam as stated previously herein.

c. Design Data - There were no engineering values, assumptions, test results or calculations available for the original construction or later spillway reconstruction. The design data available addresses only the hydraulic/hydrologic characteristics of the facility.

2.2 Construction

a. Available Data - The only construction data available consists of "As-Built" plans for the original dam and the 1916 raising, and for the facility improvements, all of which are included in the Appendix Section B.

b. Construction Considerations - No information was available.

2.3 Operation

Lake level readings are taken daily. No formal operation and maintenance, or documentation procedures are in effect. Someone is usually present at the dam site during the day.

2.4 Evaluation

a. Availability - Existing data was provided by the owner, the Bridgeport Hydraulic Company. The owner made the dam available for visual inspection.

b. Adequacy - The engineering data available was not sufficient to perform an in-depth assessment of the dam. Therefore, the final assessment of this investigation must

be based primarily on visual inspection, performance history and hydraulic/hydrologic assumptions.

c. Validity - A comparison of record data and visual observations reveals no observable significant discrepancies in the record data.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General - In general, the dam appears to be in good condition, however, there are some areas in need of maintenance.

b. Dam

Downstream Slope - The downstream slope of the earth embankment is grass covered and is, in general, in good condition. At several locations some minor sloughing of the slope has taken place. At one such area in front of the 23rd concrete wall arch (from the left abutment), the depression and bulge are between 6 in. to 2 ft in depth and height, and each is about 4 ft. by 4 ft in area. The soil at the top of the embankment is soft and has local depressions at several locations, generally in the inside of the arches, i.e. next to the concrete buttresses. No seeps, wet or spongy areas were observed on the downstream embankment slope. However, the previous night it had rained, and thus minor wet areas or seeps could not have been detected.

Crest - The concrete crest of the dam in general appears to be in good condition. Some seepage has occurred at construction joints on the downstream face of dam resulting in efflorescence and spalling of concrete surfaces. Heavy spalling has also occurred at the right end of the dam adjacent to the spillway. There have been movements of a block of concrete at the end of the concrete dam wall. There is no visual evidence of these movements being related to foundation movements.

c. Appurtenant Structures

Spillway - The spillway was excavated in bedrock, which is exposed at the right abutment and immediately downstream of the spillway. There is a minor seep through the bedrock observed at the left side and a few feet downstream of the spillway. The water is clear. The right wingwall of the spillway does not have weep holes, and it is in good condition. The left wall has moved into the spillway channel apparently by rotation on its foundation. This is probably due to a combination of freezing pressures and water pressures which, because of the absence of weep holes through the wall, are superimposed on the existing earth pressures.

The spillway channel is in good condition,the bottom consisting of hand-placed stone. There is a small amount of vegetation growth which should be periodically removed. There are some trees whose branches hang over the channel, which do not represent a potential for future obstruction of the channel.

3.2 Evaluation

The visual inspection was sufficient to assess the dam as being generally in good condition. However, some features will require continuing periodic inspection and/or maintenance.

1. The left wing wall of the spillway has apparently moved continuously, and references to the movements and repair of the cracks are made in several prior inspection reports. The movements to date are not large enough to endanger the safety of the wall; however, the continuous attention required by the wall movements would indicate that some remedial action should be taken in the future, such as installation of weep holes and a drainage layer against the wall to reduce water pressures and also to reduce pressures due to freezing soil behind the wall.

2. The minor sloughing of the downstream slope and the soft area, and depressions on the top of the earth embankment, probably indicate the result of leaks through the concrete wall above and below the level of the top of the embankment. However, there are no indications of a significant stability problem of the earth embankment as a result of such leaks.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Regulating Procedure

The reservoir is maintained as high as possible without overflowing the spillway, in order to provide an adequate water supply as needed. In addition to the reservoir drainage area, Mean Brook diversion reservoir and diversions from the Farm Mill River and the Housatonic River supply water to the reservoir. A description of the operational facilities used to regulate the water flow through the outlet works is included in the Bridgeport Hydraulic Company correspondence in the Appendix, Section B.

4.2 Maintenance of Dam

The grassed area is well maintained, and the dam presents a good appearance. The concrete surfaces of the dam are not well maintained, especially around the spillway and construction joints, which are heavily spalled in places. The left spillway channel wall is cracked and has undergone significant movement. The maintenance which has been performed to correct these problems to date has not been effective.

4.3 Maintenance of Operating Facilities

To our knowledge, there are no formal operational procedures or documentation of procedures that are followed. The 30 inch transmission main is used to supply water to the Bridgeport area, and is maintained to continue operation. The 30 inch low level line is opened at least once a year for 24 hours, closed, and then opened again for 24 hours.

4.4 Description of Any Warning System in Effect

There is no formal warning system in effect. The owner employs a security guard to visit the dam once a day.

4.5 Evaluation

A formal program of operation and maintenance procedures should be instituted, to include accurate documentation of all procedures for future reference.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data - No design computations could be found for the original 1905 dam construction, the 1916 raising of the dam, or facility improvements made in 1963 or 1969.

b. Experience Data - The maximum recorded water level over the spillway during the August and October 1955 floods was 8 3/4 inches on October 16, 1955.

c. Visual Observations - Although trees overhang the spillway channel in places, it is unlikely that any blockage of the spillway would occur.

d. Overtopping Potential - The Test Flood for this high hazard intermediate size dam is equal to the Probable Maximum Flood (PMF) of 1400 cfs.

Based upon our hydraulics computations, the spillway capacity is 4300 cubic feet per second (Appendix D-9). Based upon "Preliminary Guidance for Estimating Maximum Probably Discharges" dated March 1978, peak inflow to the reservoir is 2600 cubic feet per second (Appendix D-8); peak outflow (Test Flood) is 1400 cubic feet per second with the dam maintaining a 1.8 foot minimum freeboard (Appendix D-10).

Since the watershed area (1.1 square miles) of Trap Falls is smaller than two square miles, it may be appropriate to consider higher intensity short duration storms. One such calculation is shown in Appendix D.

e. Spillway Adequacy - The spillway will pass in excess of 100 percent of the Test Flood at elevation 319.8 (top of dam elevation), while maintaining a minimum dam freeboard of 1.8 feet.

f. Downstream Flooding - Utilizing the April 1978 "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs", the peak failure outflow from the dam would be 128,000 cfs (Appendix D-14). A breach of the dam would result in a 24 foot wave immediately downstream causing severe loss of life and property damage.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations - The observations discussed in Section 3 did not disclose any immediate stability problem. As discussed in Section 3, minor sloughing of the embankment and movement of the left spillway channel wall should be monitored to determine whether further deterioration occurs. Concrete surfaces, especially around construction joints and at the spillway and abutment walls, are heavily spalled and in need of maintenance. Spalling around the construction joints caused by seeps in usually accompanied by efflorescence and staining of the wall.

b. Design and Construction Data - The design and construction data available is not sufficient to perform a formal stability analysis. For example, there is no data on the foundation grade, or on the criterion for bedrock excavation to reach the foundation grade of the original dam and of the buttresses when the dam was raised. The earth embankment materials for the embankment zoning are not known, so that the contribution of the earth embankment to the overall dam stability cannot be assessed.

c. Operating Records - The operating records do not contain information that indicates past stability problems. Observed movements of the spillway left wall and soft areas and depressions in the earth embankment have been recorded.

d. Post-Construction Changes - Since raising of the dam in 1916, modifications of the outlet structures have been made which involved excavating into the downstream embankment. Some settlements of the ground were observed against such structures, reflecting some consolidation of the backfill around the structures. There are however, no visual indications that modifications and additions to the outlet structures have caused any stability problems.

e. Seismic Stability - This dam is in Seismic Zone 1 and hence does not have to be evaluated for seismic stability, according to the Recommended Guidelines.

SECTION: 7 ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition - Based upon the visual inspection at the site and past performance history, the dam appears to be in good condition. No evidence was observed of structural instability in the embankment or concrete section, and the condition or the earth embankment is generally good. There are some areas which require attention.

Minor excavations have been made on the embankment near the downstream toe, and minor old sloughs are apparent on the downstream slope near the face of the dam. Construction at the toe of the downstream slope should probably be discouraged.

Based upon our hydraulics computations, the spillway capacity is 4300 cubic feet per second, which is in excess of 100 percent of the Test Flood. Based upon "Preliminary Guidance for Estimating Maximum Probable Discharges" dated March 1978, peak inflow to the reservoir is 2600 cubic feet per second; peak outflow (Test Flood) is 1400 cubic feet per second with the dam maintaining a 1.8 foot minimum freeboard.

Utilizing the April 1978 "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs", the peak failure outflow from the dam would be 128,000 cubic feet per second. A breach of the dam would result in a 24 foot wave which would cause severe loss of life and damage to property downstream of the dam at residences and a manufacturing plant.

b. Adequacy of Information - The design and construction information is inadequate to perform an in-depth assessment of the dam. Therefore, the assessment of the condition of the dam is based solely on a visual inspection and on verbal and written accounts of the performance of the dam.

c. Urgency - The recommendations and remedial measures presented in Sections 7.2 and 7.3 should be implemented within the time frame specified in each section.

d. Need for Additional Information - There is a need for additional information as described in Section 7.2.

7.2 Recommendations

The recommendations presented in this section should be implemented within one year of the owner's receipt of this Phase I Inspection Report.

1. The movements of the left wingwall of the spillway should be monitored, and if the rate of movements indicate it necessary, remedial action should be taken, such as the installation of weep holes and placement of a properly filtered layer of free draining material against the back of the wall. Should damage to the wall increase, it may also become necessary to perform repair work on the wall itself.

7.3 Remedial Measures

a. Alternatives - This study has identified no practical alternatives to the above recommendations.

b. Operation and Maintenance Procedures - The following measures must be undertaken within one year of the owner's receipt of this report, and continued on a regular basis.

1. Normal maintenance of the spillway channel should require cutting of tree branches overhanging the channel in addition to continuing the removal of vegetation from the channel bottom.

2. Minor sloughing of the ground surface on the downstream face and near the top of the embankment should be observed periodically to assure that no further movement is occurring.

3. Maintenance of spalled concrete where it occurs at construction joints and concrete surfaces should be carried out on a regular basis. Leaching of water through construction joints and cracks in the concrete surfaces should be repaired to prevent further deterioration of the concrete.

4. A formal program of operation and maintenance procedures should be instituted, and fully documented to provide accurate records for future reference.

5. The program of yearly inspections of the dam by an engineer qualified in dam inspection should be continued.

6. Round the clock surveillance should be provided by the owner during periods of unusually heavy precipitation. The owner should develop a formal warning system with local officials for alerting downstream residents in case of emergency.

APPENDIX

SECTION A: VISUAL OBSERVATIONS

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Trap Falls Reservoir Dam **DATE:** June 8, 1978

TIME: ———

WEATHER: Cloudy, Wet

W.S. ELEV. 311.9 **U.S.** —— **DN.S**

PARTY:	INITIALS:	DISCIPLINE:
1. Mike Horton	MH	Structural
2. Gonzalo Castro	GC	Geotechnical
3. Hector Moreno	HM	Hydraulic
4. Peter Heynen	PH	Party Chief
5.		
6.		

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Concrete and Earth Dam Embankment	GC/MH/PH	
2.	Spillway-Approach, Channel, Weir, Discharge Channel	GC/MH	
3.	Outlet Works-Control Tower, Operating House, Gate Shafts	HM	
4.	Reservoir	HM	
5.	Operation and Maintenance	PH	
6.	Safety and Performance Instrumentation	PH	
7.			
8.			
9.			
10.			
11.			
12.			

PERIODIC INSPECTION CHECK LIST

PROJECT Trap Falls Reservoir Dam **DATE** June 8, 1978

PROJECT FEATURE Concrete and Earth Dam Embankment

AREA EVALUATED	BY	CONDITION
Concrete Structure		
Crest Elevation	PH	Concrete Parapet uniform across top elevation 316.
Current Pool Elevation	PH	one (1) inch below spillway crest.
Maximum Impoundment to Date	PH	Recorded daily. Records at Bridgeport office.
General Condition of Concrete Surfaces	PH/ MH	Heavily spalled.
Condition of Joints	MH	Generally poor, spalling.
Spalling	PH/ MH	Yes.
Visible Reinforcing	MH	Occasional end of reinforcing rod.
Rusting or Staining of Concrete	PH	Yes.
Any Seepage of Efflorescence	PH/ MH	Yes.
Joint Alignment	PH/ MH	Satisfactory.
Cracking	MH	Some.
Rusting or Corrosion of Steel	MH	None.
Erosion or Cavitation	MH	None.
Alignment of Monoliths	MH	Good.
Numbering of Monoliths	MH	Some settlement at right end of dam.
Differential Settlement	GC	None apparent except at right end of wall which does not appear to be related to the foundation.
Condition of Structure Foundation		No observable problems.
Structure Additions	PH	Dam raised 10' in 1916.

PERIODIC INSPECTION CHECK LIST

PROJECT Trap Falls Reservoir Dam **DATE** June 8, 1978

PROJECT FEATURE Concrete and Earth Dam Embankment

AREA EVALUATED	BY	CONDITION
Earth Fill		
Surface Cracks	GC	None apparent.
Lateral Movement	GC	Minor slumping of slope at serveral locations.
Vertical Alignment	GC	No misalignment observable.
Horizontal Alignment	GC	No misalignment observable.
Condition at Abutment and at Concrete Structures	GC	Good except soft at some locations next to buttresses.
Indications of Movement of Structural Items on Slopes	GC	None apparent.
Trespassing on Slopes	PH	Test pits.
Sloughing or Erosion of Slopes or Abutments	PH	Slight at top of embankment.
Rock Slope Protection-Riprap Failures	GC	Not applicable.
Unusual Movement or Cracking at or near Toes	GC	None apparent.
Unusual Embankment or Downstream Seepage	GC	None observed.
Piping or Boils	GC	None observed.
Foundation Drainage Features	GC	None known.
Toe Drains	GC	None known.
Instrumentation System	PH	Right end of dam, horizontal only.

PERIODIC INSPECTION CHECK LIST

PROJECT Trap Falls Reservoir Dam **DATE** June 8, 1978

PROJECT FEATURE Spillway-Approach, Channel, Weir, Discharge Channel

AREA EVALUATED	BY	CONDITION
a. Approach Channel		Not applicable.
General Condition		
Loose Rock Overhanging Channel		
Trees Overhanging Channel		
Floor of Approach Channel		
b. Weir and Training or Sidewalls		
General Condition of Concrete	MH	Sidewalls spalled, cracked.
Rust or Staining	PH	Yes, left abutment.
Spalling	PH	Yes, minor areas except left abutment.
Any Visible Reinforcing	PH	None apparent.
Any Seepage or Efflorescence	MH	Yes.
Drain Holes	GC	None.
c. Discharge Channel		
General Condition	GC	Good.
Loose Rock Overhanging Channel	GC	None.
Trees Overhanging Channel	GC	A few.
Floor of Channel	GC	Good condition, hand-placed stone.
Other Obstructions	GC	None.

PERIODIC INSPECTION CHECK LIST

PROJECT Trap Falls Reservoir Dam **DATE** June 8, 1978

PROJECT FEATURE Outlet Works-Control Tower, Operating House, Gate Shafts

AREA EVALUATED	BY	CONDITION
a. Concrete and Structural		
General Condition	PH	Good, considering age 50+ years.
Condition of Joints	PH	No apparent problems.
Spalling	PH	Minor spalling only.
Visible Reinforcing	PH	None apparent.
Rusting or Staining of Concrete	PH	None apparent.
Any Seepage or Efflorescence	PH	None apparent.
Joint Alignment	PH	Good.
Unusual Seepage or Leaks in Gate Chamber	PH	None observed-chamber filled to 1" below spillway.
Cracks	PH	None observed.
Rusting or Corrosion of Steel	PH	Some, nothing major.
b. Mechanical and Electrical		
Air Vents	PH	None.
Float Wells	PH	None.
Crane Hoist	PH	None.
Elevator	PH	None.
Hydraulic System	PH	None.
Service Gates	PH	All gates manually operated.
Emergency Gates	PH	NA.
Lighting Protection System	PH	NA.
Emergency Power System	PH	NA.

PERIODIC INSPECTION CHECK LIST

PROJECT Trap Falls Reservoir Dam **DATE** June 8, 1978

PROJECT FEATURE Reservior

AREA EVALUATED	BY	CONDITION
Shoreline	PH	Trees and sandy shores.
Sedimentation	PH	None apparent.
Potential Upstream Hazard Areas	PH	None observed.
Watershed Alteration-Runoff Potential	PH	None apparent.

PERIODIC INSPECTION CHECK LIST

PROJECT Trap Falls Reservoir Dam **DATE** June 8, 1978

PROJECT FEATURE Operations and Maintenance

AREA EVALUATED	BY	CONDITION
a. Reservoir Regulation Plan	PH	Mean Brook, Farm Mill, and Housatonic diversions.
Normal Conditions	PH	Reservoir maintained as high as possible; usually is below spillway.
Emergency Plans	PH	No plan-owner has its own security guard. Dam visited at least once a day
Warning System	PH	No formal system.
b. Maintenance (Type) (Regularity)		
Dam	PH	Someone is usually at dam site during day.
Spillway		
Outlet Works	PH	At least once a year, 30 inch blowoff opened and filled for 24 hours, then closed, then opened again for 24 hours.

PERIODIC INSPECTION CHECK LIST

PROJECT Trap Falls Reservoir Dam **DATE** June 8, 1978

PROJECT FEATURE Safety and Performance Instrumentation

AREA EVALUATED	BY	CONDITION
Headwater and Tailwater Gages	PH	Daily readings are taken of water level.
Horizontal and Vertical Alignment Instrumentation (Concrete Structures)	PH	None.
Horizontal and Vertical Movement, Consolidation, and Pore-Water Pressure Instrumentation (Embankment Structures)	PH	Horizontal movement is monitored at the left end of spillway.
Uplift Instrumentation	PH	None.
Drainage System Instrumentation	PH	None.
Seismic Instrumentation	PH	None.

APPENDIX
SECTION B: EXISTING DATA

SPECIAL NOTE

SECTION B

AVAILABILITY OF DATA

The correspondence listed in the Summary of Contents and the plans listed in the Table of Contents, Appendix Section B, are included in the master copy of this report, which is on file at the office of the Army Corps of Engineers, New England Division, in Waltham, Massachusetts.

Only the following correspondence is included in this report.

SUMMARY OF CONTENTS

DATE	TO	FROM	SUBJECT	PAGE
1971	Files	Bridgeport Hydraulic Co.	Plant Inspection 1971	B-36
1972	Files	" " "	Plant Inspection 1972	B-39
1973	Files	" " "	Plant Inspection 1973	B-42
1975	Files	" " "	Plant Inspection 1975	B-45
Nov. 16, 1976	Bridgeport Hydraulic Co.	Roald Haestad Inc. Consulting Engineers	1976 Dam Inspection	B-46
1977	Files	Bridgeport Hydraulic Co.	Plant Inspection 1977	B-50

Note: Correspondence obtained from the State of Connecticut Water Resources Commission and the Bridgeport Hydraulic Company.

Trap Falls Reservoir is the main storage and distribution reservoir for the eastern portion of the Bridgeport Hydraulic Company service area. In addition to surface waters from its own and adjacent watersheds, Trap Falls receives water from the Housatonic well field via Means Brook diversion reservoir and 36 inch pipeline. Approximately 30 percent of the water distributed by Bridgeport Hydraulic Company passes through Trap Falls Reservoir.

As withdrawal rates steadily increased, operating characteristics of the reservoir outlet works became unsatisfactory. Head losses were excessive, and proper cleaning of the screens became an increasing problem, particularly in the Fall when large quantities of leaves are carried into the intake ports. Considering that the Company was well underway in a program to increase both delivery from the Housatonic well field and transmission capacity from Trap Falls Reservoir to Bridgeport, it was obvious that the reservoir's outlet works would have to be improved.

The old outlet works were constructed originally in 1905 and modified in 1916. Four gated inlet ports in a 45-foot deep intake well on the reservoir side of the dam permit the withdrawal of shallow, intermediate or deep water. Two 3/8-inch mesh screens, in the form of half-cylinders with screening on top and bottom, are mounted in a -foot by 3-foot opening in the wall dividing intake and outlet wells. Raw water flows via a 30" cast iron outlet pipe through the dam to a venturi meter and gate house. Chemicals, including Chlorine, Lime and

algon, are injected directly after the meter and further ownstream the old 30-inch line is teed into a newly installed 6-inch transmission main.

New criteria set for the outlet works included the following:

a. - Provide peak flow rate capacity of 40 mgd.

b. - Provide finer screening to improve water quality, and use an automatic traveling screen to reduce operator's tending time, while maintaining clean screens.

c. - Provide a connection from the old intake to the new screening facilities to enable drawing water through the existing lower intake ports. This connection is necessary in order to secure cooler water in summer and to avoid frazil ice in the winter, using the traveling screen.

To accomplish the above at minimal expense while maintaining full flow to the distribution system, a new screen well chamber was built between and supported on two buttresses on the downstream face of the dam. This chamber houses a traveling screen supplied by Rex Chain Belt Company; nominal basket width is 7 feet, center-to-center sprocket depth 28 feet, and screen mesh is 1/8 inch. A high pressure spray backwash system is used and automatic indexing of the screen s provided by means of a differential controller. A 48-inch intake

was cut through the dam directly into the reservoir and a new 36" connection carried through the dam from the old to the new intake well; butterfly valves are used in both intake lines. A new 36-inch raw water main runs to the treatment plant and thence ties directly into the newly installed 36-inch transmission main.

A heated head house was constructed over the screen well to shield the screen, controls, operators, etc.; a metal enclosure houses the spray system and screen head machinery. Chemical feed connections, a new Venturi meter and taps for the service water and screen wash water pumps are all in the new 36-inch outlet line and housed in a new basement, first step in the construction of an addition to the existing treatment plant.

Still to be completed are renovations of the old outlet works, including installation of new sluice gates, new butterfly outlet valve, new drain valve and reworking of existing screen guides. The old outlet works will be used for standby service, and also to provide cooler water in summer and warmer water in winter.

A construction schedule was followed which enabled the Company to maintain full flow to the distribution system without constructing temporary outlet facilities. The old intake facilities were used while the new were being constructed, and the new will be used while the old are renovated. (A temporary flange is used to block the interconnection.) Stop logs were used while the 48-inch intake was cut through the dam; the guides eventually will be used

to hold coarse bar racks. Interconnections between the 30-inch and 36-inch service mains, at the treatment plant and further downstream, permitted the use of either while providing for proper dispersion of chemicals.

Consulting engineers for the project are Hazen & Sawyer of New York; prime contractor is E & F Construction Company of Bridgeport.

TRAP FALLS DAM

(PLANT INSPECTIONS - 1975)

General

The dam and spillway appear structurally sound. Maintenance of the area is satisfactory. Following repairs/maintenance are required:

1. Repairs to railing as detailed below.
2. Replace cap on railing near screen chamber.
3. Seal spillway joints.
4. Check design capacity of raceway channel.
5. Clean the lower gatehouse and paint its gate.
6. Repair and paint stairway on the slope of dam. Remove the grass from around the lower stairway.

Inspection was made on November 7, 1975 with the pond down 4.3 ft.

Upper Gatehouse

Excellent condition.

Lower Gatehouse

In good condition. Needs general cleaning of the inside. The old residual recorder and other stored items should be cleared away from the operating area. The door badly needs painting.

Upstream Face of Dam

In good condition. There are many areas of exposed aggregate and minor deterioration.

Downstream Face of Dam

No seepage was noticed. Many construction joints are in poor condition and areas of deterioration, spalling and exposed aggregate were found all over the downstream face. Grass should be removed from the steel ladder.

Spillway

Fair condition. Very minor seepage was noticed (pond down about 4.5') on the downstream face. The entire downstream face has exposed aggregate but needs no repairs yet.

8-45

On the upstream side face and the crest too, there are areas of deterioration and exposed aggregate.

Raceway and Wingwalls

Fairly good condition. On the east wingwall there are several areas with spalling of concrete, cracks and exposed aggregate. Resealing of the large crack in the east wingwall next to the dam should be done. The west wingwall should be repaired at some time in the near future; there are areas of bad deterioration, and spalling of concrete.

The discharging capacity of the raceway seems inadequate. It should be checked hydraulically for design flow over the spillway.

Walkway

Good condition. Many areas of deterioration were noticed all over the eastern half - there are several cracks which should be sealed and watched. West half of the walkway is not so bad.

Railing

Good condition on the west half. A cap should be fitted on the downstream railing east of the new screen chamber. The first and ninth posts on the downstream railing on the west side are corroded at the bottom and should be repaired or replaced. The third piece from the west end (downstream side) has separated out from the coupling and should be fixed.

On the eastern half, the railing is too loose in several areas - the flanges are not tightly bolted, they are mis-oriented or broken. This condition is dangerous and should be corrected.

Coping

Good condition except for some areas of minor deterioration. Two areas on the land side face near the fourth post of the railing need repair at some spots, the reinforcing bars are exposed.

New Screen Chamber

In good condition.

1976 DAM INSPECTIONS

Dam inspections were completed by Roald Haestad, Inc., Consulting Engineers. One copy of the Dam Inspections Report is on file in the Operations Department and a second copy including slides is being retained in the Engineering Department.

TRAP FALLS RESERVOIR DAM

Statistical Information from "INVENTORY OF DAMS IN THE UNITED STATES" prepared by the Department of the Army, Office of the Chief of Engineers, 1975.

ID NO: CT91 HAZARD POTENTIAL: *

COUNTY: Fairfield RIVER OR STREAM: Pumpkin Ground Brook

TYPE: Earth Buttress HEIGHT: 41 FEET

MAXIMUM CAPACITY: 7,280 ACRE FEET

NEAREST DOWNSTREAM CITY/TOWN/VILLAGE: Stratford

POPULATION: 50,300 DISTANCE FROM DAM: 3 MILES

YEAR COMPLETED: 1905

*Unreported

BRIDGEPORT HYDRAULIC COMPANY RECORDS

HEIGHT: 87 FEET

CAPACITY: 7,172 ACRE FEET

2,337 MILLION GALLONS

RATINGS:

(Based on Guidelines and using BHCo Records)

HAZARD POTENTIAL RATING: High

SIZE RATING: Intermediate

RECOMMENDED SPILLWAY DESIGN FLOOD: PMF

LD HAESTAD, INC.

INSPECTION DATE: November 16, 1976

ROALD HAESTAD, INC: Roald Haestad
Ronald Litke

BRIDGEPORT HYDRAULIC CO: Kenneth Logan

COMMENTS

Trap Falls Reservoir:

The reservoir is down about six feet. The upstream face looks pretty good as far as we can see from the east end of the dam. There is a dip in the terrain about 150 feet or so to the east of the end of the concrete dam. Looks like natural ground and might be checked for free board.

At the gate house, we have the same electrical service connection again. There is one run with 2 single conductors and one run with 3 single conductors. The exposed wires are low enough to walk into and are a hazard to personnel. Gate house roof needs some maintenance. Railings on top of dam seem to be in good shape. The slab on the top of the dam on the eastern edge of the ogee section has cracked and has been repaired. This should be watched for additional movement. There seems to be very little cross section on the top of the dam to take care of ice loading. The very westerly end of the ogee section is into ledge. The Concrete is somewhat worn but it doesn't look too bad at all. We can see that there is some lifting taking place on the retaining wall downstream from the east end of the spillway between the rock and the bottom of the wall. Matter of fact, that entire wall has been undermined and should be filled in- think we are have some frost lifting on it. There is leakage from the other side which freezes - it is going to be difficult to have that sealed. The water pressure has to be relieved from behind the wall.

Lime is dumped in little piles here and there over the wall at the lower end of the spillway channel and should be cleaned. No unusual wet spots below the dam that we can see, with the lake down six feet.

MAXIMUM PROBABLE FLOOD INFLOWS
NED RESERVOIRS

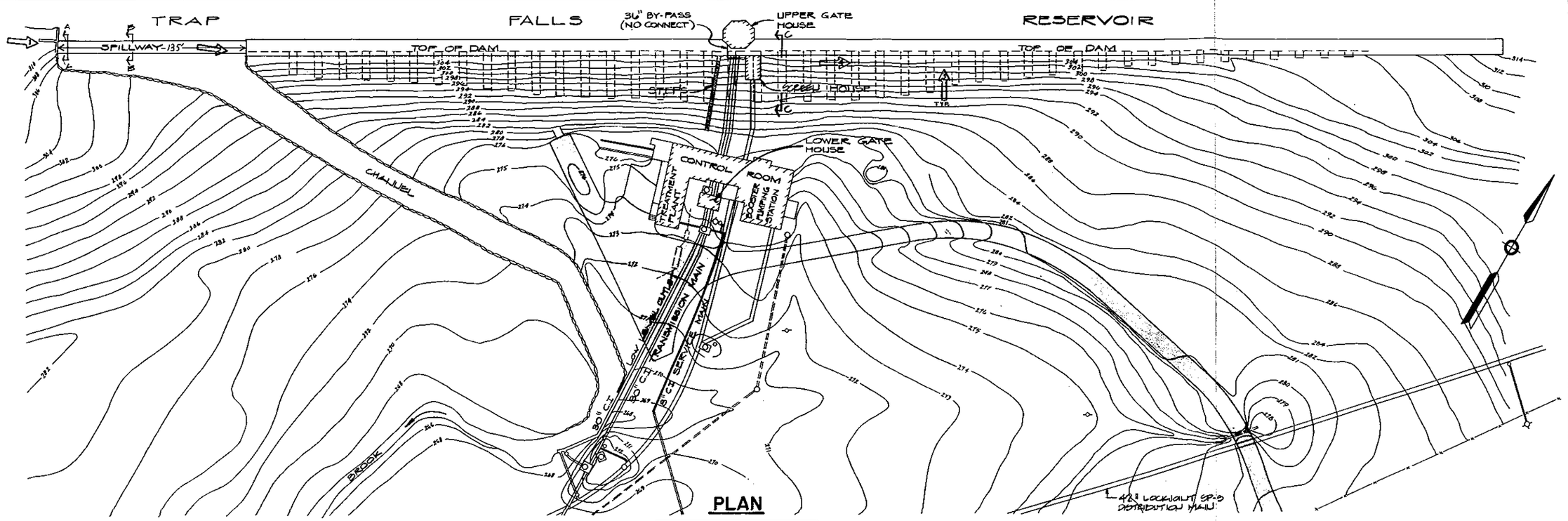
	Project	Q (cfs)	D.A. (sq. mi.)	MPF cfs/sq. mi.
1.	Hall Meadow Brook	26,600	17.2	1,546
2.	East Branch	15,500	9.25	1,675
3.	Thomaston	158,000	97.2	1,625
4.	Northfield Brook	9,000	5.7	1,580
5.	Black Rock	35,000	20.4	1,715
6.	Hancock Brook	20,700	12.0	1,725
7.	Hop Brook	26,400	16.4	1,610
8.	Tully	47,000	50.0	940
9.	Barre Falls	61,000	55.0	1,109
10.	Conant Brook	11,900	7.8	1,525
11.	Knightville	160,000	162.0	987
12.	Littleville	98,000	52.3	1,870
13.	Colebrook River	165,000	118.0	1,400
14.	Mad River	30,000	18.2	1,650
15.	Sucker Brook	6,500	3.43	1,895
16.	Union Village	110,000	126.0	873
17.	North Hartland	199,000	220.0	904
18.	North Springfield	157,000	158.0	994
19.	Ball Mountain	190,000	172.0	1,105
20.	Townshend	228,000	106.0(278 total)	820
21.	Surry Mountain	63,000	100.0	630
22.	Otter Brook	45,000	47.0	957
23.	Birch Hill	88,500	175.0	505
24.	East Brimfield	73,900	67.5	1,095
25.	Westville	38,400	99.5(32 net)	1,200
26.	West Thompson	85,000	173.5(74 net)	1,150
27.	Hodges Village	35,600	31.1	1,145
28.	Buffumville	36,500	26.5	1,377
29.	Mansfield Hollow	125,000	159.0	786
30.	West Hill	26,000	28.0	928
31.	Franklin Falls	210,000	1000.0	210
32.	Blackwater	66,500	128.0	520
33.	Hopkinton	135,000	426.0	316
34.	Everett	68,000	64.0	1,062
35.	MacDowell	36,300	44.0	825

Upstream Face of Dam

The upstream face of the dam is generally in good condition although some exposed aggregate and minor deterioration was observed.

Downstream Face of Dam

The earthen embankment buttressing the dam appears to be in good condition. No seepage was observed along it. The concrete section exposed along the top of the dam is in poor condition but appears to be structurally sound. Most of the vertical joints are badly deteriorated at the face of the dam. Reinforcing bars are even exposed at some joints. Corrective action should be taken soon so that serious structural damage does not occur.



NOTES: ALL INFORMATION SHOWN HEREIN HAS BEEN COMPILED FROM EXISTING RECORD DATA AND VISUAL OBSERVATIONS.

ALL ELEVATIONS SHOWN ARE BRIDGEPORT HYDRAULIC COMPANY DATUM (BHC) WHICH IS 3.80' ABOVE MEAN SEA LEVEL (MSL) - MSL = BHC + 3.80'.

DATUM CONVERSION

ELEV. 10.0 MSL = 13.8 BHC

MSL 0.0	10.0'	13.8'
BHC 0.0		

PHOTO NUMBER AND DIRECTION

CAHN ENGINEERS INC. WALLINGFORD, CONNECTICUT ARCHITECT-ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORP OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

TRAP FALLS RESERVOIR DAM

PUMPKIN GROUND BROOK — SHELTON, CONNECTICUT

DWN BY	CKD BY	APP BY	SCALE: AS NOTED	
		DWH	DATE: 6/8/78	PAGE B-62

APPENDIX

SECTION C: DETAIL PHOTOGRAPHS

PHOTO NO.1 - General view of spillway and channel with downstream facilities in background.

PHOTO NO.2 - Spillway deterioration and cracking of channel retaining wall.

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	TRAP FALLS RESERVOIR DAM PUMPKIN GROUND BROOK SHELTON, CONNECTICUT CE# 27 531 GI DATE 6/8/78 PAGE C-1
CAHN ENGINEERS INC. WALLINGFORD, CONN. ARCHITECT—— ENGINEER		

PHOTO NO.3 - Spalling and efflorescence at downstream face of dam.

PHOTO NO.4 - General view of downstream embankment. Note area of localized minor sloughing.

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	TRAP FALLS RESERVOIR DAM PUMPKIN GROUND BROOK SHELTON, CONNECTICUT CE# 27 531 GI DATE 6/8/78 PAGE C-2
CAHN ENGINEERS INC. WALLINGFORD, CONN. ARCHITECT—— ENGINEER		

APPENDIX

SECTION D: HYDRAULIC/HYDROLOGIC COMPUTATIONS

PRELIMINARY GUIDANCE

FOR ESTIMATING

MAXIMUM PROBABLE DISCHARGES

IN

PHASE I DAM SAFETY

INVESTIGATIONS

New England Division
Corps of Engineers

March 1978

MAXIMUM PROBABLE FLOOD INFLOWS
NED RESERVOIRS

	Project	Q (cfs)	D.A. (sq. mi.)	MPF cfs/sq. mi.
1.	Hall Meadow Brook	26,600	17.2	1,546
2.	East Branch	15,500	9.25	1,675
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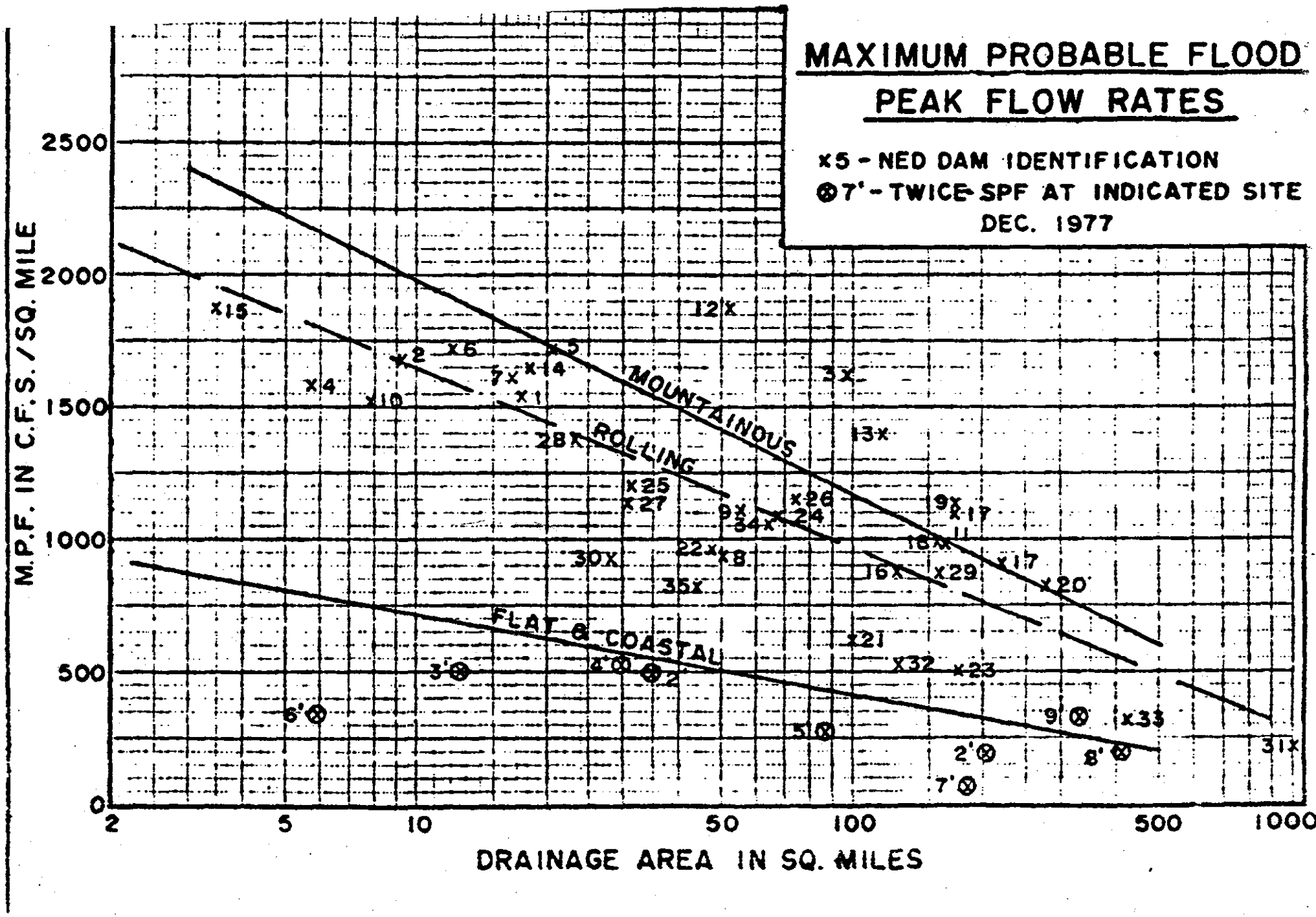
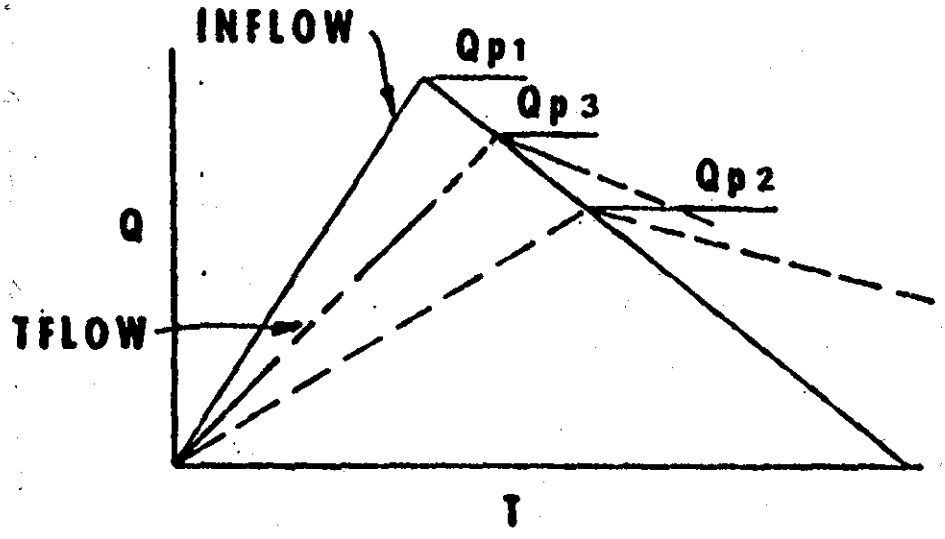
30.	West Hill	26,000	28.0	928
31.	Franklin Falls	210,000	1000.0	210
32.	Blackwater	66,500	128.0	520
33.	Hopkinton	135,000	426.0	316
34.	Everett	68,000	64.0	1,062
35.	MacDowell	36,300	44.0	825

MAXIMUM PROBABLE FLOWS BASED ON TWICE THE STANDARD PROJECT FLOOD (Flat and Coastal Areas)

	River	SPF (cfs)	D.A. (sq. mi.)	MPF (cfs/sq. mi.)
1.	Pawtuxet River	19,000	200	190
2.	Mill River (R.I.)	8,500	34	500
3.	Peters River (R.I.)	3,200	13	490
4.	Kettle Brook	8,000	30	530
5.	Sudbury River.	11,700	86	270
6.	Indian Brook (Hopk.)	1,000	5.9	340
7.	Charles River.	6,000	184	65
8.	Blackstone River.	43,000	416	200
9.	Quinebaug River	55,000	331	330


MAXIMUM PROBABLE FLOOD
PEAK FLOW RATES
x5 - NED DAM IDENTIFICATION
⊗7' - TWICE SPF AT INDICATED SITE
DEC. 1977
M.P.F. IN C.F.S./SQ. MILE
2500
2000
1500
1000
500
0
2
5
10
50
100
500
1000
DRAINAGE AREA IN SQ. MILES
MOUNTAINOUS
ROLLING
FLAT & COASTAL
x15
x4
x10
x2
x6
x14
x1
12x
3x
13x
28x
x25
x27
9x
34x
x26
x24
9x
x17
30x
22x
x8
35x
16x
x29
x17
x20
x21
x32
x23
x33
31x
3'⊗
4'⊗
2
6'⊗
5⊗
9⊗
2'⊗
8'⊗
7'⊗

ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



STEP 1: Determine Peak Inflow (Q_{p1}) from Guide Curves.

STEP 2: a. Determine Surcharge Height To Pass "Q_{p1}".

b. Determine Volume of Surcharge ($STOR_1$) In Inches of Runoff.

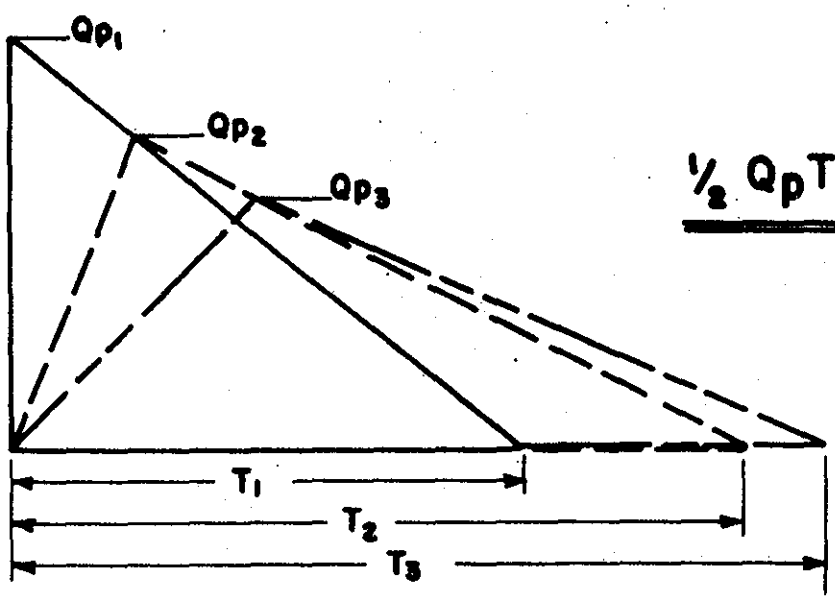
c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefor

$$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR_1}{19}\right)$$

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Q_{p2}"

b. Average "$STOR_1$" and "$STOR_2$" and Determine Average Surcharge and Resulting Peak Outflow "Q_{p3}".

"RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS



$\frac{1}{2} Q_p T = 12 S$

STEP 1: DETERMINE OR ESTIMATE RESERVOIR STORAGE (S) IN AC-FT AT TIME OF FAILURE.

STEP 2: DETERMINE PEAK FAILURE OUTFLOW (Q_{p1}).

$$Q_{p_1} = \frac{8}{27} W_b \sqrt{g} Y_o^{\frac{3}{2}}$$

W_b = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 40% OF DAM LENGTH ACROSS RIVER AT MID HEIGHT.

Y_o = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

STEP 3: USING USGS TOPO OR OTHER DATA, DEVELOP REPRESENTATIVE STAGE-DISCHARGE RATING FOR SELECTED DOWNSTREAM RIVER REACH.

STEP 4: ESTIMATE REACH OUTFLOW (Q_{p2}) USING FOLLOWING ITERATION.

A. APPLY Q_{p1} TO STAGE RATING, DETERMINE STAGE AND ACCOPMANYING VOLUME (V_1) IN REACH IN AC-FT. (NOTE: IF V_1 EXCEEDS 1/2 OF S, SELECT SHORTER REACH.)

B. DETERMINE TRIAL Q_{p2}.

$$Q_{p_2}(\text{TRIAL}) = Q_{p_1}\left(1 - \frac{V_1}{S}\right)$$

C. COMPUTE V_2 USING Q_{p2} (TRIAL).

D. AVERAGE V_1 AND V_2 AND COMPUTE Q_{p2}.

$$Q_{p_2} = Q_{p_1}\left(1 - \frac{V_{avg}}{S}\right)$$

STEP 5: FOR SUCCEEDING REACHES REPEAT STEPS 3 AND 4.

APRIL 1978

HYDROLOGIC/HYDRAULIC INSPECTION

TRAP FALLS RESENVOIR DAM, STRATFORD, CONNECTICUT

(1) MAXIMUM PROBABLE FLOOD – PEAK FLOW RATE

(a) WATERSHED ASSUMED TO BE "ROLLING TYPE".
USE MPF GUIDE CURVES FURNISHED BY THE ACE, NEW ENGLAND DIV OFFICE. FOR DETERMINATION OF MPF "ROLLING" CURVE IS USED.

(b) WATERSHED AREA: DA = 1.12 SQ. MI (AS MEASURED BY CE)
CONNECTICUT WATER RESOURCES BULLETIN No 19, 1974 - DA = 1.09 SQ. MI

(c) FROM GUIDE CURVE. (EXTRAPOLATION)
M.P.F ≈ 2,300 CFS/SQ. MI

(d) M.P.F = PEAK INFLOW
Q = 2,300 × 1.12 ≈ 2,600 CFS

(2) SPILLWAY DESIGN FLOW (SDF)

(a) CLASSIFICATION OF DAM ACCORDING TO ACE RECOMMENDED GUIDELINES.

(i) SIZE (IMPOUNDMENT): ① STORAGE (MAX) = 8,500 Ac-Ft (INTERM.)
② HEIGHT (STRUCT) = 45 Ft (INTERM)

THE TRAP FALLS RESERVOIR DAM WILL BE CLASSIFIED AS "INTERMEDIATE". D-7

FROM BRIDGEPORT HYDRAULIC CO., RECORDS – RESENVOIR CAPA. AT FLOWLINE (ELEV. 315.8 MSL) 37 MG ≈ 7112 AC-FT. AREA AT FLOWLINE = 344 AC. (CONN. WATER RESOURCES BULLETIN No 19, 1974) MEASURE = 347 Ac.). FREEBOARD: SPILLWAY CREST (ELEV. ● 315.8 MSL) TO TOP OF DAM (ELEV. ● 319.8 MSL)
ADDITIONAL STORAGE TO TOP OF DAM ≈ 350 × 4 = 1400 Ac-Ft
MAX. STORAGE ≈ 7112 + 1400 = 8512 SAY 8500 AC-FT. (U.S. INVENTORY OF DAMS, 3/10/78 R13 SHOWS 7280 Ac-Ft) ● SEE NOTE AFTER 2 (iii) P. 2.

FROM BRIDGEPORT HYDRAULIC CO., TRAP FALLS DAM GENERAL PLAN & PROFILE DWG. JUNE 1916.

HYDROLOGIC/HYDRAULIC INSPECTION
TRAP FALLS RESERVOIR, STRATFORD, CONNECTICUT

(2) (a) (CONT'd)-

SDF - CLASSIFICATION OF DAM

(ii) HAZARD POTENTIAL:

THE DAM IS U/S OF INDUSTRIAL BLDGS. & HOUSING DEVELOPMENTS, RTE 8 AND URBAN AREAS OF STRATFORD.

THEREFORE, IT IS CLASSIFIED AS OF "HIGH" HAZARD POTENTIAL

(iii) SDF

ACCORDING TO ACE RECOMMENDED GUIDELINES FOR THIS DAM THE SDF SHOULD BE THE M.P.F.

$$SDF = MPF = \underline{2600\ CFS}$$

E: BRIDGEPORT HYDRAULIC CO. DATA GIVES ELEVATIONS IN BRIDGEPORT HYDRAULIC CO. DATUM
(c) MSL (USCGS DATUM) = BHC + 3.80'

(3) EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES

(a) PEAK INFLOW (SDF = MPF)

$$Q_{P_1} = 2600\ CFS$$

NOTE: ESTIMATION WAS MADE IN ACCORDANCE WITHIN PROCEDURES OUTLINED IN ACE - NEW ENGLAND DIV GUIDELINE SHEETS

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HYDROLOGY / HYDRAULIC INSPECTION
TRAP FALLS RESERVOIR, STRATFORD, CONNECTICUT

(3) (cont'd)- EFFECT OF SURCHARGE STORAGE ON MPP'S.

(b) SURCHARGE HEIGHT TO PASS Q_{P1}

$C \simeq 3.9$

$L = 139'$ (BRIDGEPORT HYDRAULIC CO. Dwgs. JUNE 19[illegible]

$Q \simeq CLH^{3/2}$

$\therefore H = \left(\frac{Q}{CL}\right)^{2/3}$

$\therefore$ @ $Q_{P1} = 2600$ CFS

$H_1 \simeq 2.9'$

FREEBOARD OF SPILLWAY CREST TO TOP OF DAM IS 4'
THEREFORE, THE SPILLWAY IS ADEQUATE FOR $Q_{P1} = 2600$ CFS

SPILLWAY CAPACITY AT $H = 4'$, $Q \simeq 4300$ CFS

(c.) ESTIMATE EFFECT OF RESERVOIR STORAGE ON PEAK OUTFLOW.

ASSUME NORMAL POOL LEVEL TO BE 0.5 FT ABOVE THE SPILLWAY CREST

AREA AT FLOWLINE = 344 Ac

$\therefore$ VOL. OF SURCHARGE:

$344 \times (2.9 - 0.5) \simeq 830$ Ac ft

DA = 1.12 SQ. MI.

$S_1 = \frac{830}{1.12 \times 43} \simeq 14''$

HYDROLOGY / HYDRAULIC INSPECTION

TRAP FALLS RESERVOIR, STRATFORD, CONNECTICUT

(3) (CONT'd) EFFECT OF SURCHARGE STORAGE ON MPD's

(d) PEAK OUTFLOW FOR SURCHARGE S_1

NOTE: (GUIDELINE FOR ASSUMING A TRIANGULAR HYDROGRAPH AND MPF RUNOFF IN N.ENG. IS ± 19")

$$Qp_2 = Qp_1(1 - S_1/19)$$
$$Qp_2 = 2600\,(1 - \tfrac{14}{19})$$
$$= 680 \text{ C.F.S}$$

FOR $Qp_2 = 680$ CFS

$H_2 \doteq 1.2'$

$S_2 \doteq 4.0"$

$S_{AVE} = 9.0"$

(4) RESULTING PEAK OUTFLOW

$$Qp_3 = 2600\,(1 - \tfrac{9}{19})$$
$$Qp_3 = 1400 \text{ CFS}$$
$$H_3 \doteq 1.9' \text{ SAY } 2.0'$$

(f) SUMMARY: PEAK INFLOW $Qp_1 = MPF = 2600$ CFS

PEAK OUTFLOW $Qp_3 = 1400$ CFS

AVERAGE SURCHARGE HEIGHT = 2.0' ABOVE THE SPILLWAY CREST OR TO ELEV ± *318' MSL

TOP OF DAM HAS AN ELEV. OF 319.8' MSL.

*BACKWATER MAY CAUSE SOME FLOODING ALONG HUNTINGTON ST. TO THE N.E. OF THE RESERVOIR.

HYDROLOGIC / HYDRAULIC INSPECTION

TRAP FALLS RESERVOIR, STRATFORD, CONN.

DOWNSTREAM DAM FAILURE HAZARD

(I) ESTIMATE OF DOWNSTREAM DAM FAILURE HYDROGRAPH
(SEE ACE "RULE OF THUMB" GUIDELINE FOR ESTIMATING THE HYDROGRAPH)

(a) ESTIMATE OF RESERVOIR STORAGE AT TIME OF FAILURE.
(See D. SHEN COMPS. 5/18/78)

(i) MAXIMUM STORAGE CAPACITY
8500 Ac. Ft

(ii) HEIGHT OF DAM ABOVE SPILLWAY
4 Ft

(iii) AREA AT FLOWLINE
344 Ac.

(iv) HEIGHT OF MAXIMUM POOL
(FROM ± ELEV. 275' MSL TO ± ELEV. 318' MSL)
$\approx$ 43 Ft.

(b) ESTIMATE VOLUME OF RESERVOIR STORAGE AT TIME OF FAILURE

SURCHARGE ELEVATION $\pm$ 318.0' $\approx$ 2.0' ABOVE THE $\approx$ SPILLWAY CREST.

$S \approx 8,500 + 2 \times (344) = 9188$ Ac-Ft

SAY $S \approx$ 9,200 Ac-Ft, $\frac{S}{2} =$ 4,600 Ac-Ft

HYDROLOGIC / HYDRAULIC INSPECTION

TRAP FALLS RESERVOIR STRATFORD, CONN

DOWNSTREAM DAM FAILURE HAZARD

(1) (cont'd) Estimate of Downstream Dam Failure Hydrograph

(b) PEAK FAILURE OUTFLOW Q_{p_1}

(i) BREACH WIDTH

"ESTIMATE MADE ACCORDING TO "GENERAL PLAN AND PROFILE OF TRAP FALLS DAM", BRIDGEPORT HYDRAULIC CO., JUNE 1916

TOTAL LENGTH OF DAM. ± 1080 Ft

TOTAL LENGTH OF DAM AT MID-HEIGHT (± ELEV 299' MSL) ≈ ± 680 Ft.

$\therefore W = 0.4 \times 680 \approx 272'$

TAKE $W_b \approx \underline{270'}$ (BREACH WIDTH)

(ii) TOTAL HEIGHT AT TIME OF FAILURE

$y_o \approx \underline{43'}$

APPROXIMATE DEPTH OF WATER AT IMMEDIATE IMPACT AREA

$y \approx 0.44 y_o$

$\therefore y \approx 0.44(43') \approx \underline{19'}$

(iii) PEAK FAILURE OUTFLOW:

$$Q_{p_1} = \frac{8}{27} W_b \sqrt{g} y_o^{1.5} \approx \underline{128,000 \text{ CFS}}$$

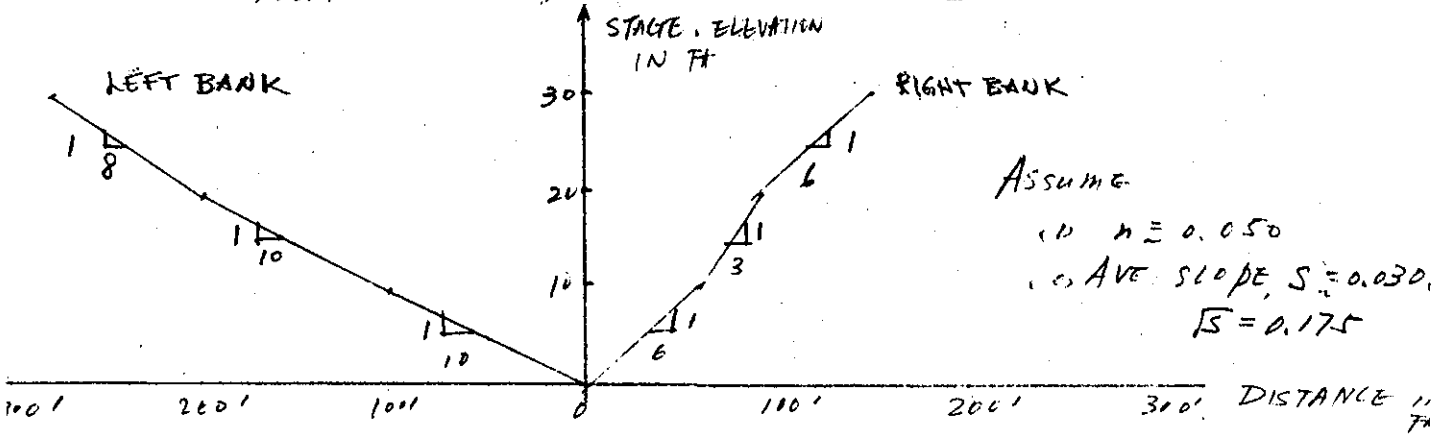
HYDROLOGIC / HYDRAULIC INSPECTION

TRAP FALLS RESERVOIR STRATFORD, CT

DOWNSTREAM DAM FAILURE HAZARD

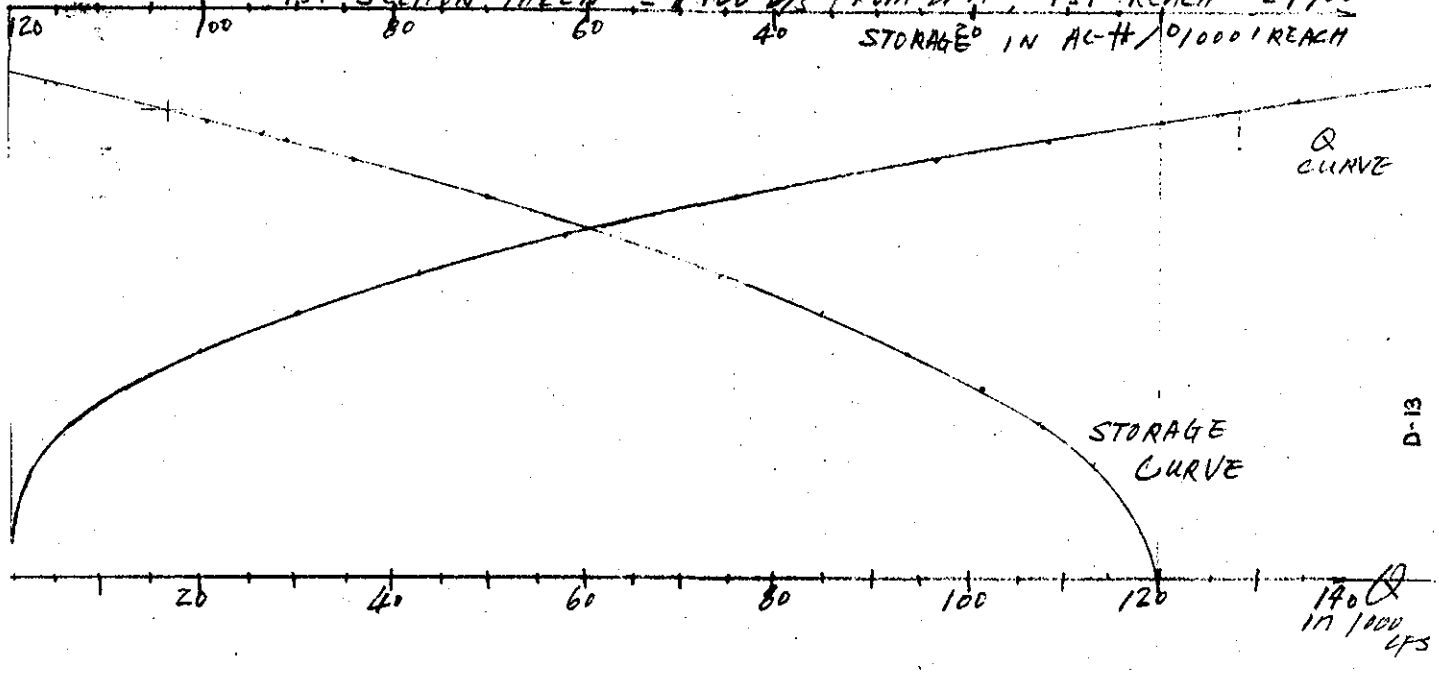
(1) (cont'd) ESTIMATE OF DOWNSTREAM DAM FAILURE HYDROGRAPH

(c) TYPICAL D/S CROSS-SECTION AND RATING CURVES (FROM USGS LONG HILL QUADRANGLE SHEET)



Assume:
(1) $n = 0.050$
(2) AVE SLOPE $S = 0.030$, $\sqrt{S} = 0.175$

1ST SECTION TAKEN ≈ 1100 D/S FROM DAM, 1ST REACH = ≈ 1700'



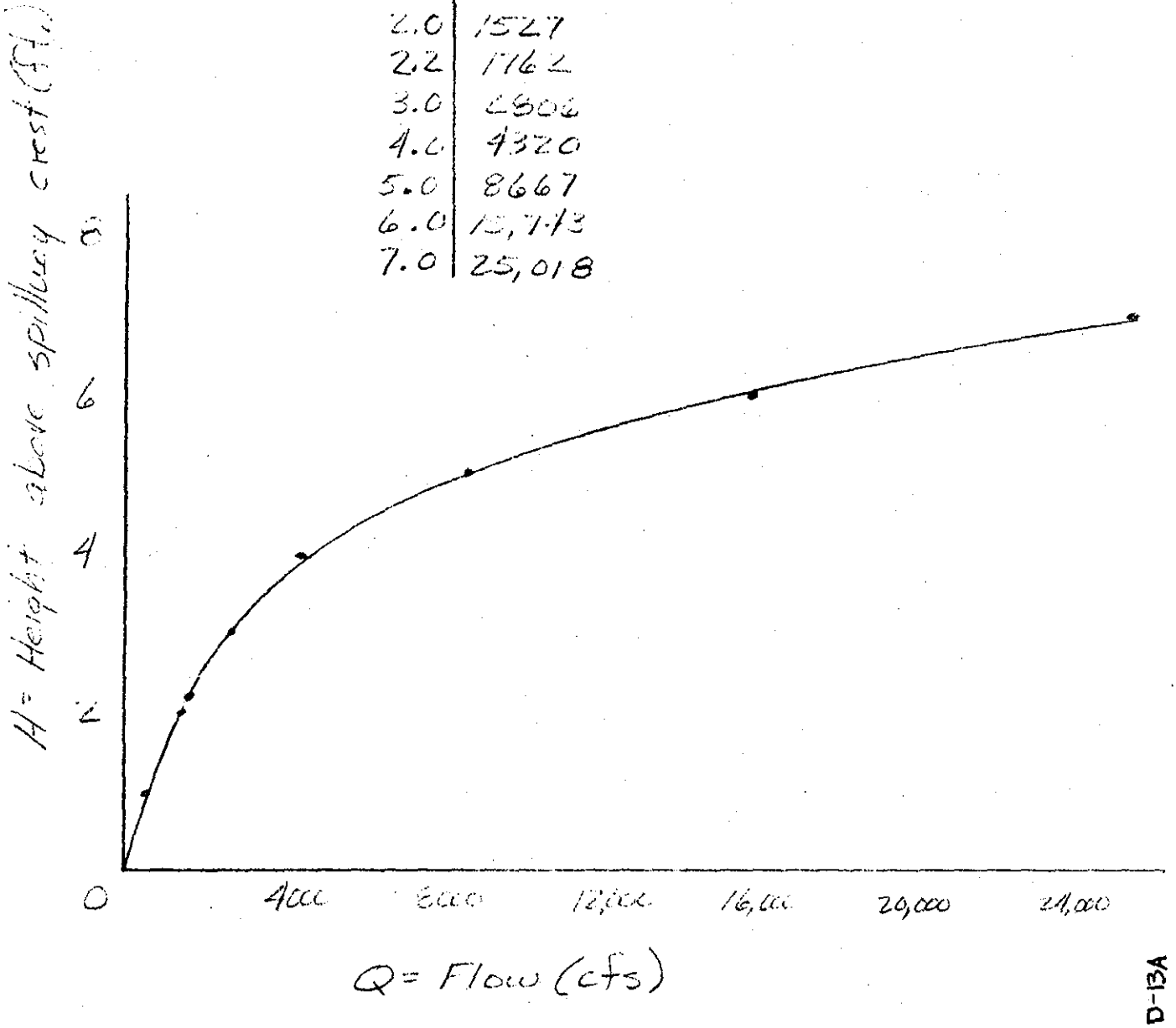
Cahn Engineers Inc. — Consulting Engineers

Project: TWIN FALLS RESERVOIR DAM — Sheet 1 of 1
Computed By: HM/CRG — Checked By: — Date: 9/5/75
Old Book Ref.: — Other Refs.: — Revisions:

SPILLWAY RATING CURVE

$$Q = 340\,H^{3/2} + 2500(H-4)^{3/2} + 130(H-4)^{5/2}$$

H (ft)	Q (cfs)
1.0	340
2.0	1527
2.2	1762
3.0	4506
4.0	9320
5.0	8667
6.0	15,713
7.0	25,018



D-13A

HYDROLOGIC / HYDRAULIC INSPECTION
TRAP FALLS RESERVOIR STRATFORD, CT
DOWNSTREAM DAM FAILURE HAZARD

(c) (CONT'D) ESTIMATE OF D/S DAM FAILURE HYDROGRAPHS

(d) PEAK REACH OUTFLOW Q_{p_2}

(i) @ $Q_{p_1} = 128,000$ CFS. STAGE $\approx$ 24.5'
VOLUME IN REACH
$V_1 \approx 103 \times 1.7 \approx 175$ Ac-ft $< \frac{S}{2}$ O.K.

(ii) PEAK REACH OUTFLOW Q_{p_2}

Q_{p_2} (TRIAL)

$$Q_{p_2} = Q_{p_1}\left(1 - \frac{V_1}{S}\right) = 128000\left(1 - \frac{175}{9200}\right)$$
$$= 126,000 \text{ CFS}$$

(iii) @ $Q_{p_2} = 126,000$ CFS. STAGE $\approx$ 24.2'
VOLUME IN REACH, $V_2 \approx 101 \times 1.7 = 172$ Ac-ft.

(iv) AVE. STORAGE IN REACH = 173 Ac-ft.

$Q_{p_2} = \underline{126,000 \text{ CFS}}$
STAGE $\approx \underline{24.2'}$ SAY 24'

(e) Summary:

PEAK FAILURE OUTFLOW = 128,000 CFS
PEAK REACH OUTFLOW: 126,000 CFS
AVE. STAGE IN D/S REACH: 24 ft.

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HYDROLOGIC/HYDRAULIC INSPECTION

TRAP FALLS RESERVOIR, STRATFORD, CT.

1A) MPF ESTIMATE FROM HIGH INTENSITY RAINFALL PERIOD OF A SHORT DURATION STORM IN A SMALL WATERSHED.

THIS PARALLEL COMPUTATION IS MADE CONSIDERING THAT FOR SMALL DRAINAGE AREAS USE BY EXTRAPOLATION OF THE MPF GUIDE CURVES FURNISHED BY THE ACE, NEW ENGLAND DIVISION, MAY GIVE PEAK RUN-OFFS OF LESSER MAGNITUDE THAN THOSE WHICH COULD PROBABLY OCCUR.

ASSUME FOR TRAP FALLS A TIME OF CONCENTRATION OF ABOUT 30 MINUTES, IN THE HIGH INTENSITY RAINFALL PERIOD OF A 6-HR RAINFALL, FOR ESTIMATING THE MAX. PROBABLE RUN-OFF.

a) 6-HR PMP AT TRAP FALLS: PMP = 24.5" (10 SQ MI ≡ PT. RAINF.)

(FROM USBR "DESIGN OF SMALL DAMS" - FIG. 1, p. 29 BASED ON HYDROMETEOROLOGICAL REPORT No. 33 - U.S. WEATHER BUREAU / U.S. CORPS OF ENGINEERS)

b) ASSUME MOST INTENSE 30 MIN. PERIOD RAINFALL ≡ 40% OF THE TOTAL 6-HR RAINFALL (USACE 43% - USBR/SCS 37%)

∴ PMP FOR 30 MIN. PERIOD ≡ 9.8" (i = 19.6"/hr)

c) ASSUME PMF FOR THIS* D.A. ≡ 70% OF THE ABOVE PMP OR,

PMF ≡ 13.7"/hr ∴ Q_p = 1.12 × 13.7 × 645.3 = 9900 CFS

*NOTE: THIS CORRESPONDS TO USE OF RATIONAL METHOD WITH C ≡ 0.70 TO 0.71

D-15

HYDROLOGIC/HYDRAULIC INSPECTION

TRAP FALLS RESERVOIR, STRATFORD, CT.

2A) THE DAM IS CLASSIFIED OF INTERMEDIATE SIZE WITH HIGH HAZARD POTENTIAL

∴ SDF RECOMMENDED BY GUIDELINES ≒ PMF ≒ 9900 CFS (PEAK INFLOW)

3A) EFFECT OF SURCHARGE STORAGE ON MAX. PROBABLE DISCHARGE

a) FOR Q_{P_1} = 9900 CFS

SPILLWAY CAPACITY (MAX.) ≒ 4300 CFS (SEE D.SHEN COMPS 5/18/78 P. 3)

SO, AT $Q = Q_{P_1}$ = 9900 CFS THE DAM WILL BE OVERTOPPED.

ASSUMING C_v = 2.7 F.: THE FLOW OVER THE MAIN DAM (L = 940') AND SIDE SPILLS (RAISING 10' IN 700') WITH AN EQ. LENGTH OF $L = \left(\frac{2}{3}\right)\left(\frac{700}{10}\right)(H-4)$

$$Q = 540H^{3/2} + 2500(H-4)^{3/2} + 130(H-4)^{5/2}$$

∴ FOR Q_{P_1} = 9900 CFS H ≒ 5.2'

b) VOLUME OF SURCHARGE @ H_1 ≒ 5.2' (NORMAL POOL ASSUMED 0.5' ABOVE CREST OF SPILLWAY - SEE D.SHEN COMPS 5/18/78 P.3)

$V_1 = 344(5.2-0.5) \doteq 1600$ AC-FT

$$\therefore S_1 = \frac{1600}{1.12 \times 53.3} \doteq 27'' > 15.8'' \text{ (SEE BELOW)}$$

c) ASSUMING THE MPF FLOOD R.O. IN NEW ENGLAND (GUIDELINES) TO BE APPROX. EQUAL TO 19", AND THE MAX. R.O. IN 6-HR TO BE 83% OF THE 24-HR R.O., OR, 15.8", THE PEAK OUTFLOW WILL BE

D-16

HYDROLOGIC / HYDRAULIC INSPECTION

TRAP FALLS RESERVOIR, STRATFORD, CT.

3A,C - Cont'd) PEAK OUTFLOW ESTIMATE.

ESTIMATED AS FOLLOWS (SEE GUIDELINES):

$S_1 \approx 27" > 15.8"$ (TOT. 6-HR R.O.) : ASSUME $S_{AVG} \approx \frac{27}{2} \approx 13"$

$\therefore Q_{P_3} \approx 9900\left(1 - \frac{13}{15.8}\right) \approx \underline{1800}$ CFS

$H_3 \approx \underline{2.2}'$ (ABOVE SPILLW. CREST) < 4' SPILLW. TO TOP OF DAM FREEBOARD. (W.L. ±EL. 318.0' MSL)

THEREFORE, THE DAM WILL NOT BE OVERTOPED UNDER THIS PMF CONDITIONS, BECAUSE OF THE EFFECT OF ITS RELATIVE LARGE RESERVOIR STORAGE CAPACITY AND EXISTING SPILLWAY. HOWEVER, THE RESULTING BACKWATER COULD FLOOD LOW AREAS ALONG HUNTINGTON ST. TO THE NORTHEAST OF THE RESERVOIR.

4A) SUMMARY

PEAK INFLOW: $Q_{P_1} \approx 9900$ CFS
PEAK OUTFLOW: $Q_{P_3} \approx 1800$ CFS
AVE. SURCHARGE $H_3 \approx 2.2'$ ABOVE SPILLWAY CREST

RESERVOIR W.L. ≈ 318.0' MSL
TOP OF DAM ELEV. ≈ 319.8' MSL
SPILLWAY CREST ELEV. ≈ 315.8' MSL (USGS LONG HILL QUAD. W.S. EL. 315 MSL)

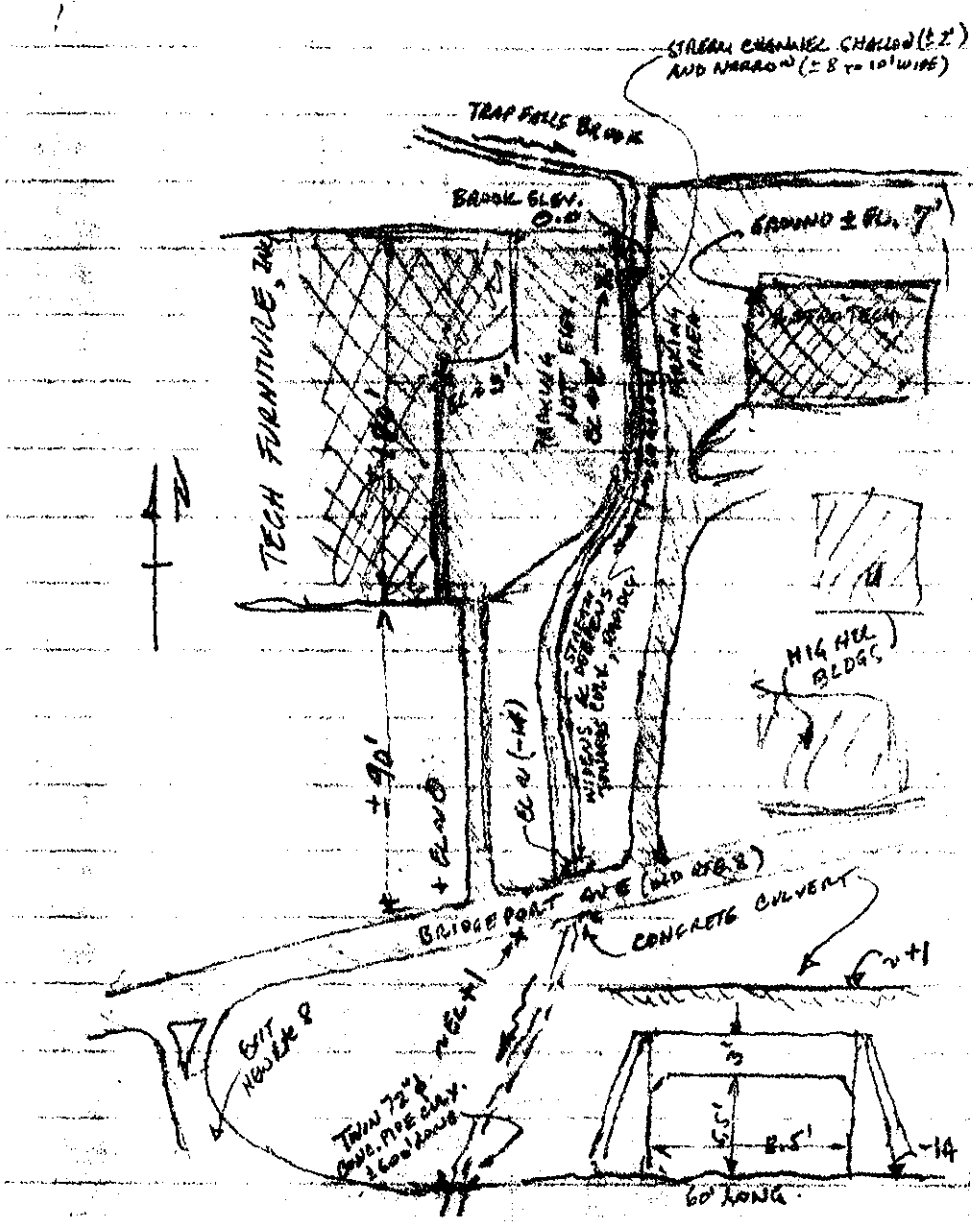
D-17

NOTE:

THESE COMPUTATIONS HAVE BEEN PERFORMED BASED UPON A DAM BREACH WITH A SURCHARGED WATER SURFACE ELEVATION. IN ACCORDANCE WITH NORMAL CORPS PROCEDURES, COMPUTATIONS ARE PERFORMED BASED UPON A WATER SURFACE ELEVATION AT THE TOP OF THE DAM. A DAM BREACH WITH THE WATER SURFACE AT THE TOP OF THE DAM AND WITHOUT HEAVY DOWNSTREAM CHANNEL FLOW COULD BE MORE CRITICAL THAN A DAM BREACH WITH A SURCHARGE. THE DIFFERENCE, IN THIS CASE, IS NOT SUBSTANTIAL.

INSPECTION OF DAMS Hell 7/12/78

TRAP FALLS RES. D/S. IMPACT AREA (STAGE ± 24')



APPENDIX

SECTION E: INVENTORY OF DAMS IN THE UNITED STATES

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COONTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(9) NAME	(10) LATITUDE (NORTH)	(11) LONGITUDE (WEST)	(12) REPORT DATE DAY | MO | YR
CT	91	NED	CT	001	05				TRAP FALLS RESERVOIR DAM	4115.9	7308.4	08SEP78

(13) POPULAR NAME	(14) NAME OF IMPOUNDMENT
	TRAP FALLS RESERVOIR

(15) REGION	(16) BASIN	(17) RIVER OR STREAM	(18) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(19) DIST FROM DAM (MI.)	(20) POPULATION
01	07	PUMPKIN GROUND BROOK	STRATFORD	5	50300

(21) TYPE OF DAM	(22) YEAR COMPLETED	(23) PURPOSES	(24) STRUCTURAL HEIGHT (FT.)	(25) HYDRAULIC HEIGHT (FT.)	(26) IMPOUNDING CAPACITIES MAXIMUM (ACRE–FT.)	(27) IMPOUNDING CAPACITIES NORMAL (ACRE–FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
CTPG	1916	S	52	48	8500	7100	NED	N	N	N	N	24AUG78

(28) REMARKS

(29) D/S HAS	(30) SPILLWAY CREST LENGTH	(31) SPILLWAY TYPE	(32) SPILLWAY WIDTH (FT.)	(33) MAXIMUM DISCHARGE (FT.)	(34) VOLUME OF DAM (CY)	(35) POWER CAPACITY INSTALLED (MW)	(36) POWER CAPACITY PROPOSED (MW)	(37) NAVIGATION LOCKS NO.	(38) LENGTH (FT.)	(39) WIDTH (FT.)	(40) LENGTH (FT.)	(41) WIDTH (FT.)	(42) LENGTH (FT.)	(43) WIDTH (FT.)	(44) LENGTH (FT.)	(45) WIDTH (FT.)
1	1080	U	138	4300												

(46) OWNER	(47) ENGINEERING BY	(48) CONSTRUCTION BY
BRIDGEPORT HYDRAULIC CO	ALBERT B HILL	

(49) REGULATORY AGENCY DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

(50) INSPECTION BY	(51) INSPECTION DATE DAY | MO | YR	(52) AUTHORITY FOR INSPECTION
CAHN ENGINEERS, INC	08JUN78	PL-367

(53) REMARKS